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# OCR A Level Computer Science H446 – Paper 1

6

## Storage devices

Unit 1
Components of a computer and their uses

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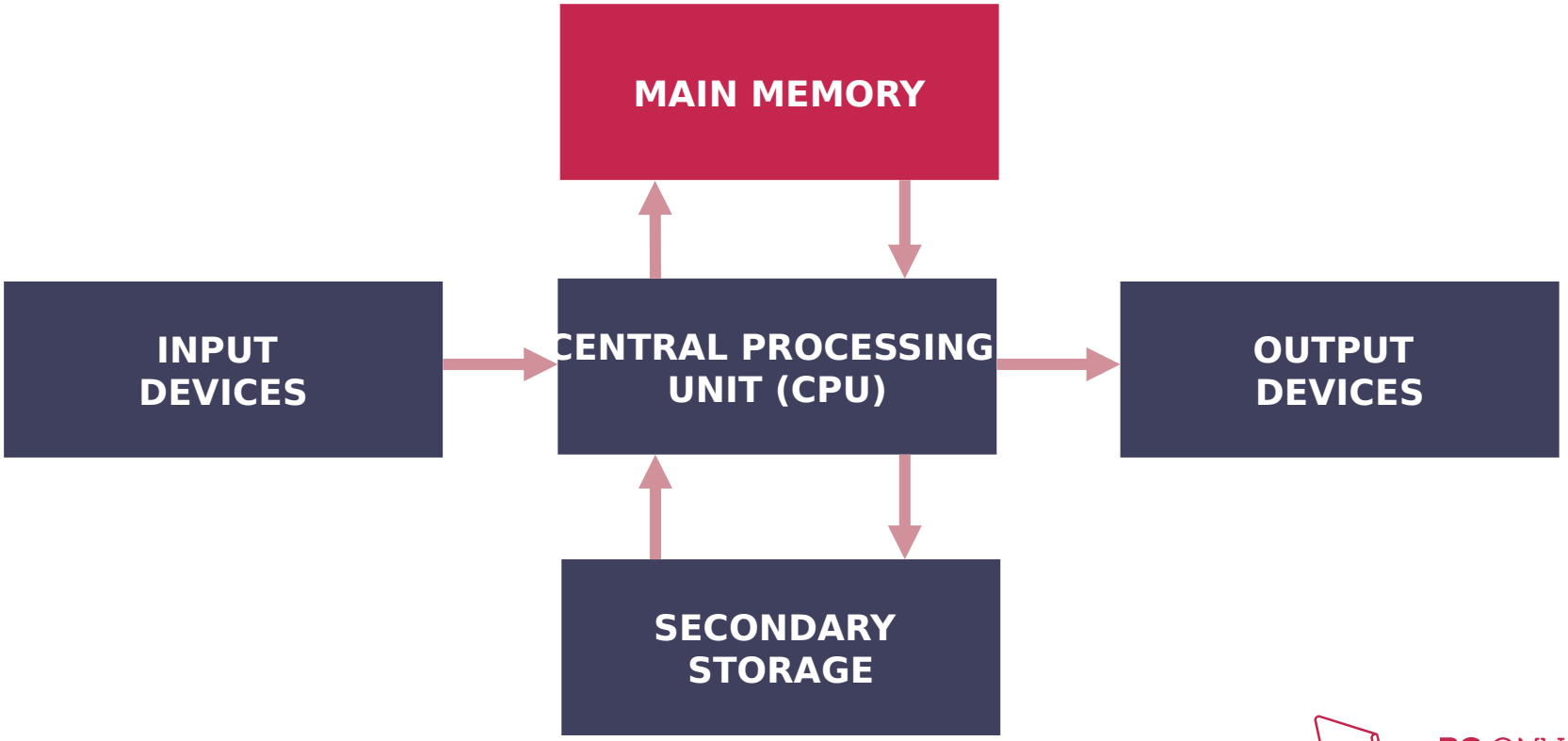
# Objectives

- Describe the characteristics and uses of RAM and ROM
- Understand what is meant by virtual storage
- Describe the uses of magnetic, flash and optical storage devices

# Primary storage / memory

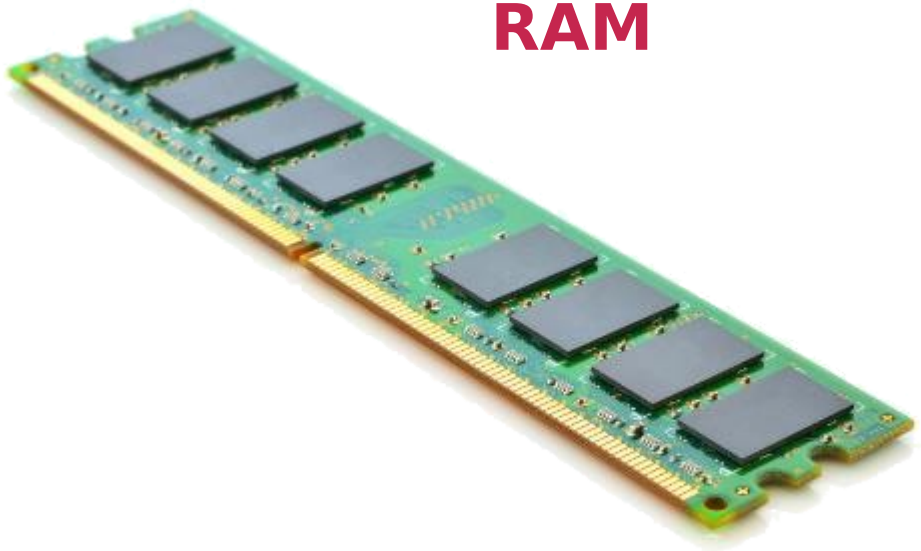
- What do you already know about memory and its role within computer systems?



# Types of memory

- There are many types of memory used in computers.
  - The two main types are:

**RAM**



**ROM**

# RAM & ROM

- **RAM** stands for **R**andom **A**ccess **M**emory
- **ROM** stands for **R**ead **O**nly **M**emory
  - What is the difference?

# RAM vs ROM

| | RAM | ROM |
|---|---|---|
| What does it stand for? | | |
| What is often stored in it? | | |
| What happens to its contents when you turn the power off? | | |
| Can you read and write data to it? | | |

# RAM vs ROM

| | RAM | ROM |
|---|---|---|
| What does it stand for? | Random Access Memory | Read Only Memory |
| What is often stored in it? | Operating system<br>Running programs<br>Data currently being used | Computing bootup instructions (Bootstrap) |
| What happens to its contents when you turn the power off? | They are lost<br>This type of memory is **Volatile** | They are retained<br>This type of memory is **Non-Volatile** |
| Can you read and write data to it? | Read & Write | Read Only |

# RAM

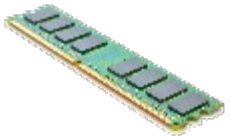
- Can be read from and written to
- Access to RAM is very fast
- At any one time it will normally contain:
    - The operating system (or part currently in use)
    - The software currently in use
    - The data which the software is using

# What makes ROM so special?

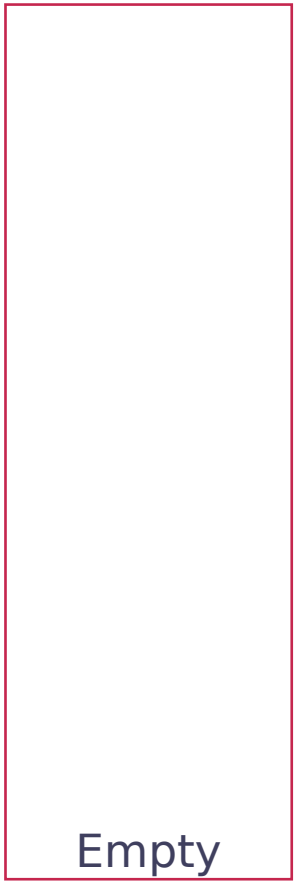
- Some data needs to be permanently held in memory, even when a computer has no power!
  - What instructions do you think a computer must instantly execute when you first switch on a computer?

# RAM

- The computer stores running programs and data in RAM when your computer is turned on
- When your computer is off, RAM is empty as it is volatile
  - All your programs and data are safe on your hard disk

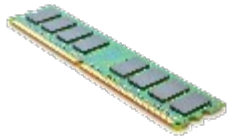


RAM



# Operating system

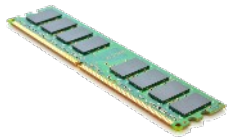
- When you switch on your computer, the startup instructions load the operating system from your hard disk into RAM



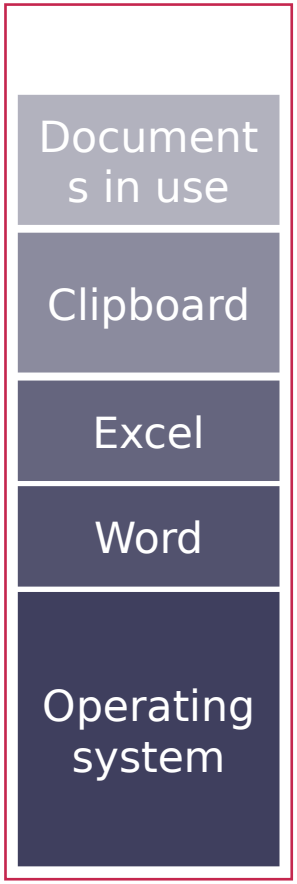
RAM

# RAM memory

- When applications or programs are loaded, they are copied into RAM from secondary storage (e.g. hard disk)
  - Documents (data) that are used with those programs are also opened by copying them into RAM as the working memory
- RAM starts to fill up



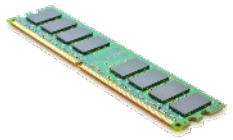
RAM



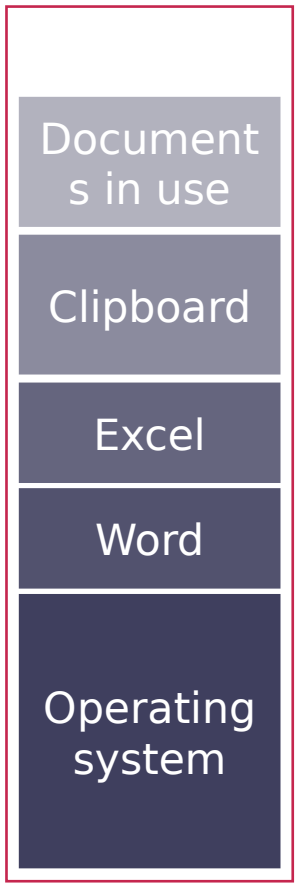
# Running out of space

- You now want to open a browser to search the Internet
- The browser software needs more memory than you have free in RAM
  - What do you think happens?

Browser



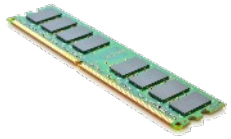
RAM



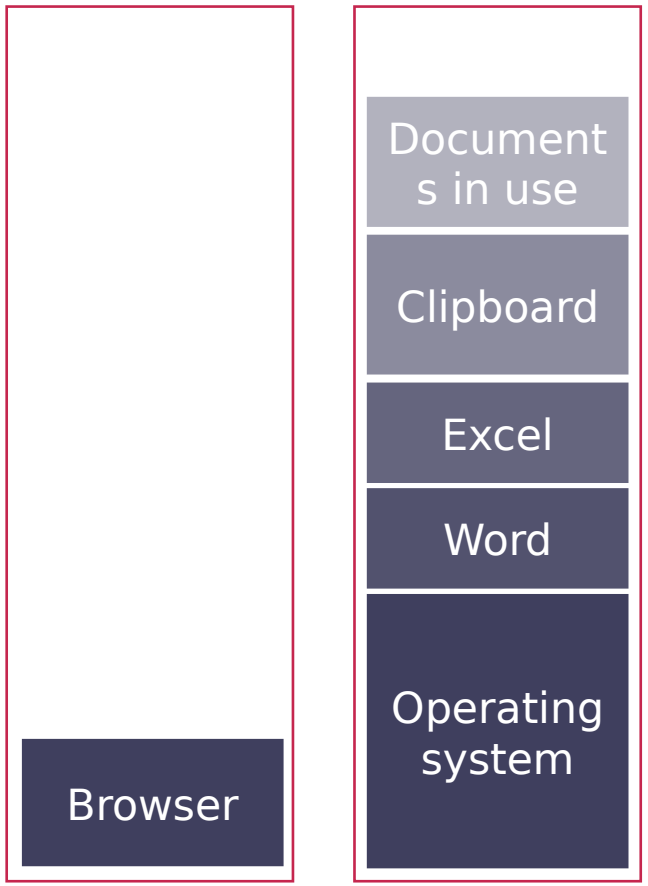
# Virtual memory

- Virtual memory is part of the hard drive used as an extension to RAM
  - What are the advantages and disadvantages of using part of the hard disk in this way?

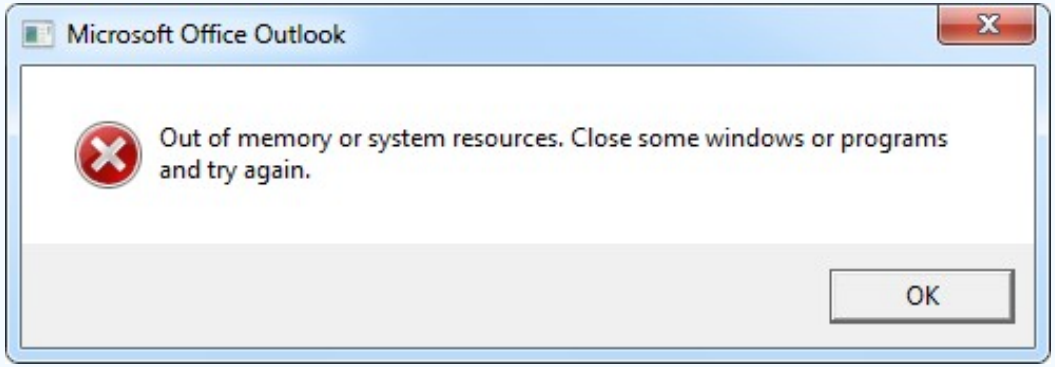
Hard Disk



RAM



# What happens when memory space completely fills up?



# Primary and secondary storage

- Primary storage is **volatile** and usually refers to RAM
- Secondary storage refers to non-volatile storage
  - Magnetic storage such as the hard disk
  - Optical storage that uses laser light such as CD-ROM
  - Solid state devices using flash memory

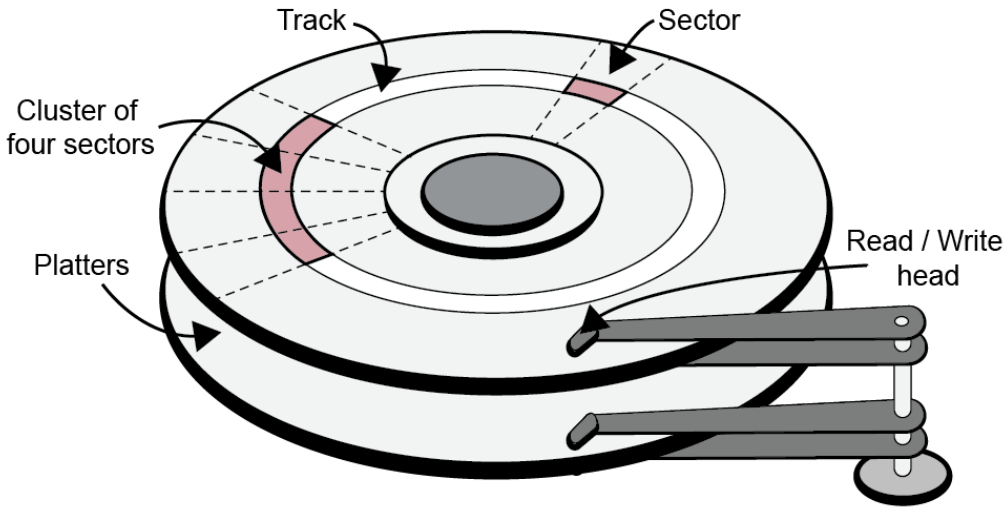
# Secondary storage devices

- Different technologies have evolved for saving data
- Each of these have their own advantages and disadvantages in terms of:
  - Durability
  - Read / write speed
  - Capacity
  - Portability and
  - Cost

# Inside a hard disk

# Tracks, sectors and platters

- Concentric tracks are created on a magnetic disk
- Disk spins at high speed: 3,600 – 7,200rpm
- Spinning platters are each read by drive heads
  - Data i er the head



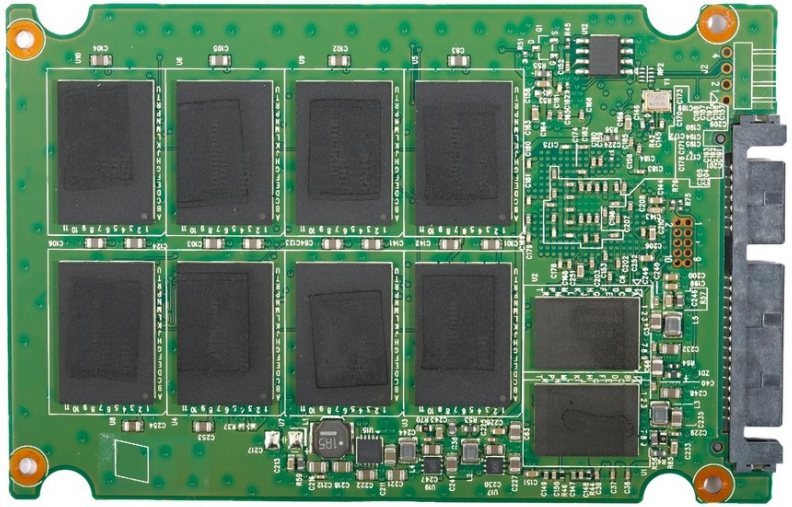
# Company server data

- Hard disks have very high capacity
  - Fast read and write speeds
  - Relatively cheap storage per TB

# Cloud storage

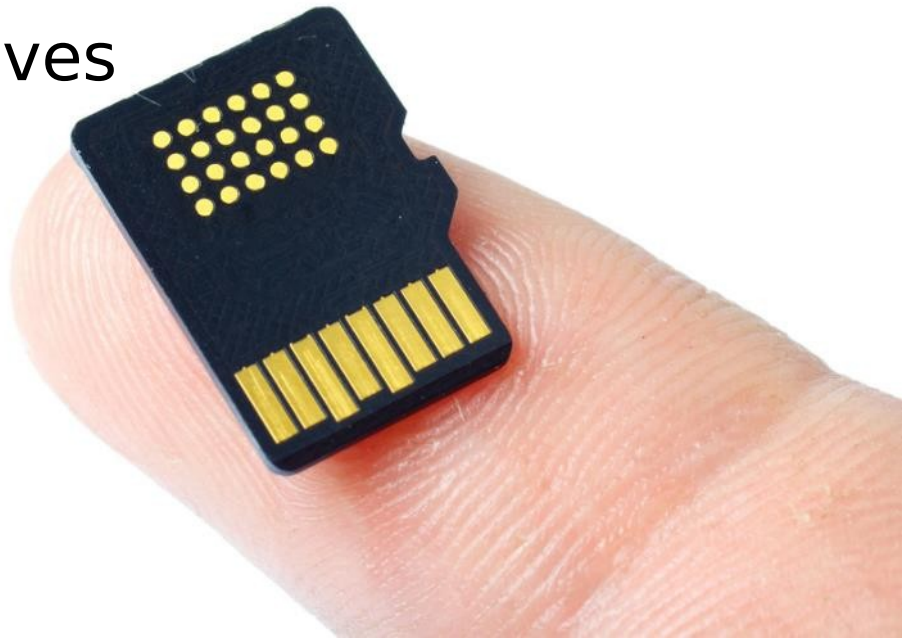
# Solid state drives

- Solid state media commonly uses electrically programmable non-volatile flash memory
  - What are the advantages and disadvantages compared with hard disk drives?



# Advantages and disadvantages of solid state media

- More durable
  - SSD cards have no moving parts so can survive drops, extreme heat and cold, and extreme pressure
- Typically less capacity than a hard disk
- Faster than hard disk drives
- Consume less power
- More portable
- More expensive than hard disk drives



# USB flash drives

- Can store up to 128Gb of data; that’s 2,500 photos
- Prices start at under £5.00
- Can use password protection
- Useful for transferring data between computers

# Military data storage systems

- What storage medium is best suited to field combat?
- Why?

# Worksheet 6

- Complete **Task 1**

# CDs, DVDs and BluRay

- Why are the capacities of these discs different given they are all the same physical size?
  - Different laser wavelengths ‘burn’ smaller pits
  - The spiral track can therefore be more tightly wound, creating a longer track

# Optical disk formats

- Optical disks are available as:
  - Read only
  - Recordable and
  - Re-writable formats

# Software mailing

- Often best suited to optical disks
- Cheap to manufacture and distribute
- Robust during carriage
- Lightweight

# CD formats

- **CD**s come in three different formats:
  - CD-ROM (Read only)
  - CD-R (Recordable)
  - CD-RW (Rewriteable)
- **CD-ROM** is “pressed” at the time of manufacture
- **CD-R** can be written to once
- **CD-RW** can be written, read many times, erased and written again
  - Suggest some uses for each format

# Uses for optical disks

- **CD-ROM** is widely used for software distribution
- **CD-R** may be used for copying a game, software, audio or video files or documents. These can then easily be stored offline
- **CD-RW** useful for short- or medium-term backup, or transferring files from one computer to another
- **DVD** and **BluRay** are high-capacity discs which can store feature-length films

# Capacity and access speed

- The development of solid state media is moving very quickly and set to replace traditional hard drives in most instances

| Media | Capacity | Access speed |
|---|---|---|
| Hard disk | | |
| CD-ROM | | |
| DVD | | |
| BluRay Disk | | |
| Solid State Disk | | |

# Capacity and access speed

- The development of solid state media is moving very quickly and set to replace traditional hard drives in most instances

| Media | Capacity | Access speed |
|---|---|---|
| Hard disk | 512 GB – 6 TB | Fast |
| CD-ROM | 700 MB | Medium |
| DVD | 4.7 – 8.5 GB | Medium |
| BluRay Disk | 25 – 50 GB | Medium |
| Solid State Disk | 4 GB – 2 TB | Very fast |

# Plenary

- Give a typical use for each of RAM and ROM
- Explain what “virtual storage” is. What problems can arise with virtual storage?
- List advantages and disadvantages of HDD vs SSD
- Describe uses for CD-ROM, CD-RW, DVD, BluRay



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